Illumination Resisted Emotion Recognition with Infrared Thermal Cameras

Background

Highly and fully autonomous driving is becoming a reality. The ability of a car to understand the feelings and emotions of occupants and provide a human-like driver assistance system can be expected to be a key factor for the success and acceptance of autonomous cars.

Description

Most of the facial-based emotion recognition systems employ normal cameras in order to extract the action units from the face of the driver and passengers in the lab environment. Although the final outcome reaches to some acceptable accuracy rate (up to 95%) yet they are failing in conditions and scenarios which happen in real life driving like highly illuminated environments. In such situations using an infrared thermal camera would be of great help.

After detecting the face with a proper face detection algorithm, HOG features can be extracted from the face image and be tested for their performance. Hidden markov models and boltzmann machines are also among the suitable candidates which is expected from the student to consider in his literature review. An acceptable feature extraction and classification method needs to be selected in order to classify the feature vectors into six different emotions. The expected outcome of this thesis is a fast and robust thermal camera-based emotion recognition system which is capable of dealing with illuminated situations while providing a high accuracy rate in classifying the emotions of the driver.

Tasks

This student project consists of the following tasks:

- Extensive literature review (2-4 weeks - before registration)
- Setting up the hardware, databases and camera (1 week)
- Modeling and implementing the face detection and registration algorithm (4 weeks)
- Developing the classification approach (4 weeks)
- Integrating the work into embedded device, Raspberry pi (1 week)
- Evaluating the development on the smart simulator (4 weeks)
- Testing and documenting (2-4 weeks)

References

- A Survey on Facial Expression Recognition: [here](#)
- Facial Expression Recognition using Deep Boltzmann Machine from Thermal Infra-red Images: [here](#)